Math 2934 (Honors) — Fall 2015
Review for second exam

The first exam will be on the material in Sections 13.3, 13.4, 14.1, 14.3, 14.4, 14.5, 14.6, 14.7, 15.1, 15.2, and 15.3 of the text. This material was covered on Assignments 4 through 8.

13.3. Arc length and curvature. From this section, you need only read the first two pages, on the integral formula for the arc length of a curve. We did not cover the remainder of this section, so you can skip it.

13.4. Velocity and acceleration. You need only read from the beginning through Example 3. We did not cover the remainder of the material in this section.

14.1. Functions of several variables. As I mentioned in class, you want to be careful not to confuse the graph of a function with the level curves of a function.

If $f(x, y)$ is a function of two variables, then the graph of the function is a two-dimensional surface in three-dimensional xyz-space given by the equation $z = f(x, y)$; but the level curves of the function are one-dimensional curves in the xy-plane given by equations of the form $f(x, y) = k$, where k is a constant. For example, if $f(x, y) = x^2 + y^2$, then the graph of the function $z = x^2 + y^2$, is a paraboloid in space, while the level curves of the function are circles in the xy-plane given by equations of the form $x^2 + y^2 = k$.

If $f(x, y, z)$ is a function of two variables, then the graph of the function is a three-dimensional object in four-dimensional space given by the equation $w = f(x, y, z)$, and in this class we haven't attempted to understand or visualize such an object. We do, however, often look at the level surfaces of a function of three variables. These are two-dimensional surfaces in three-dimensional xyz-space, given by equations of the form $f(x, y, z) = k$, where k is a constant. For example, if $f(x, y, z) = x^2 + y^2 + z^2$, then the level surfaces of $f(x, y, z)$ are spheres.

The same geometric object can sometimes be viewed in two different ways, both as a graph and as a level surface, but of different functions. For example, the surface $z = x^2 + y^2$ can either be viewed as the graph of the function $f(x, y) = x^2 + y^2$, or as a the level surface of the function $F(x, y, z) = x^2 + y^2 - z$, given by the equation $F(x, y, z) = 0$.

You should read through the examples in this section, keeping the above distinctions in mind. They will also be important in section 14.6.

14.3. Partial derivatives. You should review this section from the beginning through Example 7. You can skip the material after Example 7.

14.4. Tangent planes and linear approximations. Review the entire section. In particular, notice the difference between the equation of the tangent plane in the box on page 940 and the equation of the tangent plane in the box on page 964. The equations don't look the same. In fact, they aren't the same. What accounts for the difference? Also, compare Example 1 on page 940 with Example 8 on page 965.

14.5. The chain rule. Review the entire section.

14.6. Directional derivatives and the gradient vector. Review the entire section.

14.7. Maximum and minimum values. Review from the beginning of the section through Example 6. You do not need to memorize the second derivative test on page 971. You can safely skip the last subsection on "Absolute Maximum and Minimum Values" (pages 975–977), though it doesn't hurt to read it, either.

15.1. Double integrals over rectangles. It's very important to be familiar with the material in the first three pages of this section, pages 999–1001. Understanding this will make the rest of the course much easier, because it will help in correctly interpreting the meaning of the integrals you see in chapters 15 and 16. I won't ask any questions on the third test specifically over this material, however.

15.2. Iterated integrals.
15.3. Double integrals over general regions. You should review these two sections in their entirety.